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but that a certain number of copies should be carefully made (for deposit at certain central bureaus).

The Congress voted that in order to determine the solar parallax, it was of the highest interest to photograph the asteroids at their favorable oppositions.

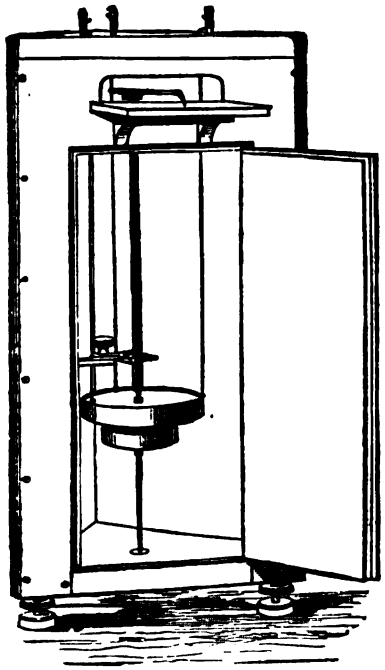
It was further voted that non-photographic spectroscopy should be included in the subjects of consideration, and that in future the title of the Congress should be *Congrès de Photographie et de Spectroscopie Célestes.*

The adjournment of the session took place on September 26th.

E. S. H.

Earthquake Observations.

The desirability of obtaining accurate records of earthquake disturbances has long been recognized. Services for this purpose are organized in Italy, Switzerland, Japan and California. For the service in California inexpensive but entirely efficient instruments have been made by copying the Duplex Seismometer, which Professor Ewing invented for Japan.



Duplex Seismometer.
(By the courtesy of *Nature*.)

Mr. Mateo Clark, of London, a member of the Society, has recently presented earthquake instruments of this description to the Observatories of Mexico, Santiago de Chili, Cordoba and Greenwich. It is hoped, if these instruments prove to be as satisfactory in their new situations as they have been in California, that they may lead to the establishment of a regular system of such stations in the different countries.

The California system includes two complete seismometric stations, at Berkeley and at Mount Hamilton, and duplex instruments (like the cut) at two points in San Francisco, at Chabot Observatory (Mr. Burckhalter), at Mr. Blinn's private observatory in East Oakland,

at Mills College (Professor KEEP), at the University of the Pacific (Professor HIGBIE), and at the headquarters of the Nevada State Weather Service (Professor FRIEND'S private observatory, Carson). An instrument will soon be set up at the foot of Mount Hamilton. Three more are needed for the Santa Clara valley—at Los Gatos, at or near Menlo Park, at or near San Mateo or San Bruno. If results of value can be attained at all, we must begin by studying the statistics of small regions. Instruments made in California have been furnished also to the United States Geological Survey (Washington), to WARNER & SWASEY (Cleveland), to Captain FLOYD (at Clear Lake), and to the Blue Hill Observatory (Massachusetts). E. S. Holden.

LIST OF EARTHQUAKES IN CALIFORNIA DURING THE YEAR 1889.

The following paper contains the dates and places of occurrence of earthquakes in California (and occasionally in Nevada) during the past year. When known, the intensity on the ROSSI-FOREL scale is given by Roman numerals enclosed in parentheses. The observations made at Mount Hamilton and reports of the different earthquakes communicated to this Observatory by letter, or published in the newspapers, will probably be printed *in extenso* elsewhere as a continuation of the lists already published by Professor HOLDEN,* containing all available data up to the end of the year 1888.

The instruments at the Lick Observatory give the means of expressing the intensity of an earthquake shock in terms of the maximum acceleration produced by the motion of the earth's surface; and it is one of the principal objects of the observations to obtain data for the comparison of the intensity determined in this way with that expressed in the ordinary terms describing the effects of earthquakes. This relation, when once established, will allow the intensity of earthquake-shocks to be stated according to a definite scale, with much greater accuracy than is possible at present. Provisional tables for the purpose have been given by Professor HOLDEN.†

A duplicate set of the instruments used at the Lick Observatory is mounted at the Students' Observatory at Berkeley, in charge of Professor SOULÉ. Seismographs of simpler pattern, which register the horizontal, but not the vertical, motion, and give no record of the

* *List on Recorded Earthquakes in California, Lower California, Oregon and Washington Territory.* (Sacramento: State Printing Office. 1887.)
Earthquakes in California (1888). *American Journal of Science*, Vol. XXXVII, May, 1889.

† *Note on Earthquake-Intensity in San Francisco (American Journal of Science*, Vol. XXXV, June, 1888).

time, are mounted at a number of stations distributed throughout the State. Of these, reports were received in 1889 from the following places:

Students' Observatory, Berkeley, in charge of Professor SOULÉ.

Chabot Observatory, Oakland, in charge of Mr. BURCKHALTER.

Private Observatory of Mr. F. G. BLINN, in East Oakland.

Observatory of the University of the Pacific, San José, in charge of Professor HIGBIE.

Observatory of Mills College, in charge of Professor KEEP.

Office of State Weather Bureau, Carson (Nevada), in charge of Professor FRIEND.

1889. *List of Earthquakes.*

Jan. 19, 1:43 A. M. Oakland (II).

Jan. 22, 7:51:58 P. M. Mt. Hamilton (I?).

Feb. 6, 9:20 P. M. Southern California. San Bernardino (VI), Colton, Los Angeles.

Apr. 3, 2:29 A. M. Mt. Hamilton (II).

Apr. 14, 7:28 P. M. Central California. Lick Observatory (III). San José, Santa Cruz, Centerville, Los Gatos, Gilroy, Merced, Oakland.

Apr. 17, 8:32:38 P. M. Mt. Hamilton (I).

Apr. 20, 4 A. M. San José.

May 1, 11:55 A. M. Lompoc.

May 1, 9 A. M.? P. M.? Susanville.

May 19, 3:10 A. M. Central California. Mt. Hamilton (V), Berkeley, Oakland (VI), East Oakland (VI), Collinsville (VII), Mills College, San Francisco, Forest Hill, San José, Stockton, Lodi, Antioch, Modesto, Napa, San Leandro, Petaluma, Rio Vista, Newark, Nevada City, Calistoga, Vacaville, Santa Cruz, Sacramento, Mountain View, Pleasanton, Haywards, Los Gatos, Fairfield, Woodland, Santa Rosa, Ione, Suisun.

May 26, 7:13 A. M. Central California, Mt. Hamilton (II). San Francisco, Gonzales, Santa Cruz.

June 6, 4 A. M. Oakland (II).

June 6, 8:30 P. M. San Bernardino (III).

June 9, 3:44:24 P. M. Mt. Hamilton (I).

June 10, 7:33:7 A. M. Mt. Hamilton (II).

June 19, 10 P. M. Lassen county, California and Nevada. Susanville, series of shocks; Chico, Sacramento. Downieville, Grass Valley, Carson City (Nev.).

June 20. Susanville, shocks during the day.

June 20, P. M. San José.
June 24, about 4 A. M. San José.
June 25, 3 A. M. San Diego, Carson City, Nev. (III).
June 27–28, during night. Carson City, Nev.
June 30, between 8 and 10 A. M. Carson City, Nev. (II) or (III).
July 2–3, during night. Carson City (II).
July 4, 8:05 A. M. Carson City, Nev. (II).
July 4–5, during night. Carson City.
July 6–7, during night. Carson City.
July 9–10, during night. Carson City.
July 10, and preceding days. Arroyo Grande, San Luis Obispo county, a number of shocks.
July 25, 10:8:0 P. M. Mt. Hamilton (IV–V).
July 31, 4:46:45 A. M. Mt. Hamilton (V), Oakland, East Oakland (VI)), Berkeley, San Francisco, San José, Sacramento, Napa, Petaluma, Martinez, Gilroy, Santa Cruz, Centerville, Los Gatos, Santa Rosa, Benicia, Newark, Concord, San Leandro.
July 31, 6:19:39 P. M. Oakland (I).
Aug. 7, 3:42:11 P. M. Mt. Hamilton (?), suspected (I?).
Aug. 13, 4:43 A. M. Oakland (III–IV).
Aug. 23, 2:32:47 P. M. Mt. Hamilton (I).
Aug. 27, 6:15 P. M. Southern California, San Bernardino (III), Pomona (VI–VII), Los Angeles (VI), Santa Ana, Santa Monica, Pasadena.
Sept. 24, 8 A. M. Napa, Winters, Woodland.
Sept. 29, 8–10 P. M. Wawona, Kingsbury.
Sept. 30, 12:17:30 P. M. Kingsbury.
Oct. 24, 7:20 A. M. East Oakland (II).
Nov. 14, 6:54 P. M. San Lorenzo.
Nov. 15, 7:55 P. M. East Oakland (II), Healdsburg.
Dec. 2, 6:30 P. M. East Oakland. J. E. K[illegible]

Determination of the Longitude of Mt. Hamilton.

Bulletin No. 13 of the U. S. Coast and Geodetic Survey (Oct. 7, 1889), gives the results of a longitude campaign made by Messrs. Sinclair and Marr, of the Survey, during October and November, 1888. The results are:

	h.	m.	s.	
Lafayette Park Station, S. F., ...	8	9	42.77	W. of Greenwich.
Mt. Hamilton C. Survey Station, . .	8	6	33.72	" "
Mt. Hamilton (Lick Observatory), . .	8	6	34.81	" "

The probable error (estimated) is about 0s.1.